GEPHE SUMMARY

Gephebase Gene
prolyl endopeptidase (PREP) (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^prolyl endopeptidase (PREP)^#gephebase-summary-title)

Entry Status
Published

GepheID
GP00002108

Main curator
Courtier

PHENOTYPIC CHANGE

Trait Category
Morphology (https://www.gephebase.org/search-criteria?/and+Trait Category=^Morphology^#gephebase-summary-title)

Trait
Coloration (scales) (https://www.gephebase.org/search-criteria?/and+Trait=^Coloration (scales)^#gephebase-summary-title)

Trait State in Taxon A
lighter black

Trait State in Taxon B
darker black - lizards on Pigash lava flow

Ancestral State
Taxon A

Taxonomic Status
Intraspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Intraspecific^#gephebase-summary-title)

Taxon A

Latin Name
Uta stansburiana (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Uta stansburiana^#gephebase-summary-title)

Common Name
-

Synonyms
Uta antiqua; Uta stellata; Uta stansburiana Baird & Girard, 1852; USNM 12666; USNM:12666

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Sauropsida; Sauria; Lepidosauria; Squamata; Bifurcata; Unidentata; Episquamata; Toxicofera; Iguania; Phrynosomatidae; Phrynosomatinae; Uta

Parent
Uta () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 43651)

NCBI Taxonomy ID
43653 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 43653)

is Taxon A an Infraspecies?
No

Taxon B

Latin Name
Uta stansburiana (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Uta stansburiana^#gephebase-summary-title)

Common Name
-

Synonyms
Uta antiqua; Uta stellata; Uta stansburiana Baird & Girard, 1852; USNM 12666; USNM:12666

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Sauropsida; Sauria; Lepidosauria; Squamata; Bifurcata; Unidentata; Episquamata; Toxicofera; Iguania; Phrynosomatidae; Phrynosomatinae; Uta

Parent
Uta () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 43651)

NCBI Taxonomy ID
43653 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 43653)

is Taxon B an Infraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
PREP

Synonyms
PE; PEP

String
9606.ENSP00000358106 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier=9606.ENSP00000358106)

Sequence Similarities
Belongs to the peptidase S9A family.

GO - Molecular Function
GO:0004175 : endopeptidase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004175)
GO:0004252 : serine-type endopeptidase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004252)
GO:0070012 : oligopeptidase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0070012)
GO:0070008 : serine-type exopeptidase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0070008)

UniProtKB Homo sapiens
P48147 (http://www.uniprot.org/uniprot/P48147)

GenebankID or UniProtKB
()

GO:0008236 : serine-type peptidase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0008236)

GO - Biological Process

GO:0006508 : proteolysis (https://www.ebi.ac.uk/QuickGO/term/GO:0006508)

GO - Cellular Component

GO:0005737 : cytoplasm (https://www.ebi.ac.uk/QuickGO/term/GO:0005737)
GO:0005829 : cytosol (https://www.ebi.ac.uk/QuickGO/term/GO:0005829)
GO:0016020 : membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0016020)
GO:0005634 : nucleus (https://www.ebi.ac.uk/QuickGO/term/GO:0005634)

Presumptive Null

No (https://www.gephebase.org/search-criteria?/and+Presumptive Null=^No^#gephebase-summary-title)

Molecular Type

Cis-regulatory (https://www.gephebase.org/search-criteria?/and+Molecular Type=^Cis-regulatory^#gephebase-summary-title)

Aberration Type

Unknown (https://www.gephebase.org/search-criteria?/and+Aberration Type=^Unknown^#gephebase-summary-title)

Molecular Details of the Mutation

no coding mutation associated with the phenotype - 2 differentiated SNPs in introns and one is a synonymous change.

Experimental Evidence

Association Mapping (https://www.gephebase.org/search-criteria?/and+Experimental Evidence=^Association Mapping^#gephebase-summary-title)

Main Reference

The Genetic Basis of Adaptation following Plastic Changes in Coloration in a Novel Environment. (2018) (https://pubmed.ncbi.nlm.nih.gov/30197088)

Authors

Corl A; Bi K; Luke C; Challa AS; Stern AJ; Sinervo B; Nielsen R

Abstract

Phenotypic plasticity has been hypothesized to precede and facilitate adaptation to novel environments [1-8], but examples of plasticity preceding adaptation in wild populations are rare (but see [9,Â 10]). We studied a population of side-blotched lizards, Uta stansburiana, living on a lava flow that formed 22,500 years ago [11] to understand the origin of their novel melanic phenotype that makes them cryptic on the black lava. We found that lizards living on and off of the lava flow exhibited phenotypic plasticity in coloration but also appeared to have heritable differences in pigmentation. We sequenced the exomes of 104 individuals and identified two known regulators of melanin production, PREP and PRKAR1A, which had markedly increased levels of divergence between lizards living on and off the lava flow. The derived variants in PREP and PRKAR1A were only found in the lava population and were associated with increased pigmentation levels in an experimental cohort of hatchling lizards. Simulations suggest that the derived variants in the PREP and PRKAR1A genes arose recently and were under strong positive selection in the lava population. Overall, our results suggest that ancestral plasticity for coloration facilitated initial survival in the lava environment and was followed by genetic changes that modified the phenotype in the direction of the induced plastic response, possibly through de novo mutations. These observations provide a detailed example supporting the hypothesis that plasticity aids in the initial colonization of a novel habitat, with natural selection subsequently refining the phenotype with genetic adaptations to the new environment. VIDEO ABSTRACT.

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Additional References

RELATED GEPHE

Related Genes

1 (protein kinase cAMP-dependent type I regulatory subunit alpha (PRKAR1A)) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^43653^/and+Trait=Coloration/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

@Plasticity - PREP is known to digest alpha melanocyte stimulating hormone (a-MSH) = a hormone that stimulates the production of melanin